Characterization of Ion- bombardment induced modifications of periodic La/B_4C-multilayer-mirrors for the reflection of soft X-ray radiation — •Fabian Merschjohann[1], Maike Lass[1], Lennart Gorholt[1], Marc D. Sacher[1], Franz Schäfers[2] und Ulrich Heinzmann[1] — [1]Molecular and Surface Physics, Bielefeld University, D-33615 Bielefeld — [2]Helmholtz-Zentrum Berlin für Materialien und Energie, Elektronenspeicherring BESSY II

The applicability of reflective optical components for the soft X-Ray region depends on the existence of multilayer-optics. Therefore stacks of alternating layers of two materials with different refractive index are applied. For the photon energy range of 100 - 190 eV Lanthanum (La) is favoured as the absorber material and Boroncarbide (B_4C) as the spacer material. Thin periodic layer systems of those materials with double layer periods of 5.6 nm have been produced by UHV Electron Beam Evaporation. The layer thickness is controlled by in-situ X-Ray Reflectometry. The purity and the stoichiometry of the layers has been analyzed by electron beam induced in-situ Auger Spectroscopy. Ion Polishing of each interface should diminish the interface roughness and thus enhance the reflectivity. The modification of the La- and B_4C-layers due to ion bombardment has been investigated by the in-situ Auger Spectroscopy, ex-situ X-Ray Diffraction and at-wavelength reflectivity measurements by use of Synchrotron radiation at the BESSY II facility. Effects of compaction, mixing, sputter-etching and smoothing have been found. The modifications can be influenced by varying the kinetic energy of the ions and/or the duration of the treatment.

DS 9.43 Mon 15:00 Poster D1

X-ray waveguides fabricated by thin film techniques — •Sven Philip Krüger, Giewekemeyer Klaus, Kalbfleisch Sebastian, Henrike Neubauer, and Tim Salditt — Georg-August Universität, Institut für Röntgenphysik, 37075 Göttingen, Deutschland

Waveguides can be used for spatial and coherent filtering of x-rays. We present a two-component waveguide design [1] of enhanced transmission efficiency at carbon guiding layer cross-sections up to sub-10 nm fabricated by magnetron sputtering. The transmission is enhanced by choosing an appropriate molybdenum interlayer. At the same time a strongly absorbing germanium cladding allows for short waveguide lengths which lead to an enhanced efficiency of the waveguide. We used an arrangement of two short waveguide slices to obtain an two-dimensionally confining waveguide with an effective source size of sub-15 nm^2. A first imaging experiment of a test pattern is presented and the images are reconstructed by holographic and iterative phase retrieval algorithms.

[1] T. Salditt et al, Phys. Rev. Lett. 100, 184801, (2008).

DS 9.44 Mon 15:00 Poster D1

Multilayer Bragg Fresnel Zone Plate for coherent HHG radiation — •Christian Späth[1], Michael Hofstetter[2], Jürgen Schmidt[1], Ferenc Krausz[1,2], and Ulf Kleineberg[1,2] — [1]Fakultät für Physik, Ludwig Maximilians Universität München, Garching, Germany — [2]Max Planck Institut für Quantenoptik, Garching, Germany

Coherent Diffractive Imaging in the (soft) X-ray regime is an emerging new lens-less X-ray microscopy technique with the future potential of molecular or even atomic resolution, because it is ultimately limited by the wavelength of the illuminating radiation and not by the imaging quality of the x-ray lens. However, this technique depends on the availability of coherent x-ray sources as well as optics for spectral filtering and focusing. We describe the development fabrication and testing of a reflective multilayer Bragg Fresnel phase zone plate for focusing coherent XUV radiation at 13 nm wavelength from a High Harmonic Generation source. This x-ray optical device serves for spectral filtering as well as sub-micron focusing of the HH spectrum in a single element for largely reduced losses. Large zone plate structures (conventional, spiral) matching the HH beam size are recorded by e-beam lithography in ultrathin HSQ e-beam resist and over-coated with a reflective Mo/Si multilayer by Ion Beam Deposition. By accurately matching the groove depth of the diffractive structure to odd multiples of the quarter Bragg wavelength, the total diffraction efficiency can be improved by a factor of 4 theoretically compared to amplitude structures.

DS 9.45 Mon 15:00 Poster D1

Preparation of a heater and sensor arrangement on Si_3N_4 thin membranes for in-plane thermal conductivity measurements — •David Hartung, Torsten Henning, and Peter J. Klar — I. Physikalisches Institut, Justus-Liebig-Universität Gießen, Germany

The aim of this work is to characterize the lateral heat flow in a thin material layer on a Si_3N_4 membrane. Thin Si_3N_4 membranes (200 nm thickness, 500 μm × 500 μm) on Si-substrates (200 μm thickness, 2.5 mm × 2.5 mm) fabricated by Plano GmbH are used as substrates for the heater and sensor arrangement. A meandering Ag wire along the middle axis of the membrane serves as an electric heater, three Ag-wires of 5 μm thickness at different distances from, but parallel to the heater wire, serve as temperature sensors. The arrangement was defined by electron-beam-lithography on to the membrane. After a development step thin layers of chrome, working as a primer and then silver as the actual wire material were evaporated on to the structured PMMA. A following lift off step completes the nanofabrication of the wire arrangement on the membrane. (spp 1386)

DS 9.46 Mon 15:00 Poster D1

3ω measurements of thermal conductivity in oxide thin films — •Stefanie Wiedigen[1], Manuel Feuchter[2], Christian Jooss[1], and Marc Kamlah[2] — [1]Institute for Materials Physics, University of Göttingen — [2]Institute for Materials Research II, KIT

Several novel approaches for high- efficiency thermoelectric devices are based on thin film geometries like multilayer structures or nanosized devices. Thereby, the 3ω method is one of a few measurement techniques which allows a reliable determination of thin film thermal conductivity. However, the application of the 3ω method on complex geometries and material combinations needs an extension of the standard evaluation techniques. In this contribution, we analyze the conditions for high precision measurements based on the 3ω method in experiment and numerical simulations. For the thin film configurations investigated here, the heat conduction problem is solved by the numerical finite element method. Techniques for modeling the problem and evaluating the results are under development to study the impact of parameters as heater geometry, film thickness and frequency on the voltage signal. The simulation results are compared with the measured frequency spectrum of the ac voltage determined by a 4 terminal geometry. The measurements are performed for Manganite and Cobaltate thin films as promising new thermoelectric materials on $SrTiO_3$ and MgO substrates with different bulk thermal conductivity. Our results are the first steps for an optimization of the measurement configurations and the evaluation of the applicability of common analytical solutions.

DS 9.47 Mon 15:00 Poster D1

Modelling thermoelectric properties of ZnO/ZnS multilayer systems with a network model — •Florian Gather, Gert Homm, Markus Piechotka, Christian Heiliger, Peter J. Klar, and Bruno K. Meyer — I. Physikalisches Institut, Justus-Liebig-University, Heinrich-Buff-Ring 16, 35392 Giessen

Two different types of ZnO/ZnS multilayer systems are investigated. The first is a multilayer system with alternating layers of ZnO and ZnS. The second one consists of a chequer-board pattern of the two materials. For the modeling of the electric and thermal properties of both systems a two-dimensional network model was used. The spatial properties such as layer thicknesses and interface roughness are translated into a pixel grid. In order to calculate the thermal or electric resistance, each pixel cell consists of a node with a local resistance connected to the four nearest-neighbour pixel cells. The calculated total resistance of the network is then converted into an either electric or thermal conductance of the multilayer structure. To calculate the effective Seebeck-coefficient of the system a temperature difference between the contacts is applied. Then the individual temperature differences between the nodes are determined and used to calculate the local Seebeck-voltages. These are now implemented into the electric resistance network via voltage sources. To determine the effective Seebeck-coefficient of the multilayer structure the voltage between the contacts of the multilayer structure is calculated and divided by the applied temperature difference. The influence of the spatial parameters on the thermoelectric properties is studied. (SPP 1386)

DS 9.48 Mon 15:00 Poster D1

Ab initio investigations of ZnO/ZnS interfaces — •Michael Bachmann, Robert Henrich, and Christian Heiliger — I. Physikalisches Institut, Justus Liebig University Giessen, D-35392, Germany

ZnO/ZnS nanostructures are a promising material for thermoelectric applications due to the expectation of a strong phonon scattering at the interface but a high transmission of electrons through the interface. Therefore, the atomic positions, the coupling of the atoms, and